FOURTH GRADE SCIENCE

GRADE LEVEL CONTENT EXPECTATIONS

4

SCIENCE

v.4.07

Welcome to Michigan's K-7 Grade Level Content Expectations

SCIENCE PROCESSES

PHYSICAL SCIENCE

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Purpose & Overview

In 2004, the Michigan Department of Education embraced the challenge of creating Grade Level Content Expectations in response to the federal No Child Left Behind Act of 2001. This act mandated the existence of a set of comprehensive state grade level assessments in Mathematics and English Language Arts that are designed based on rigorous grade level content. In addition, assessments for science in elementary, middle and high school, were required. To provide greater clarity for what students are expected to know and be able to do by the end of each grade, expectations for each grade level have been developed for science.

In this global economy, it is essential that Michigan students possess personal, social, occupational, civic, and quantitative literacy. Mastery of the knowledge and essential skills defined in Michigan's Grade Level Content Expectations will increase students' ability to be successful academically, and contribute to the future businesses that employ them and the communities in which they choose to live.

Reflecting best practices and current research, the Grade Level Content Expectations provide a set of clear and rigorous expectations for all students, and provide teachers with clearly defined statements of what students should know and be able to do as they progress through school.

Development

In developing these expectations, the Scholar Work Group depended heavily on the *Science Framework for the 2009 National Assessment of Educational Progress* (National Assessment Governing Board, 2006) which had been the gold standard for the high school content expectations. Additionally, the *National Science Education Standards* (National Research Council, 1996), the Michigan Curriculum Framework in Science (2000 version), and the *Atlas for Science Literacy,* Volumes One (AAAS, 2001) and Two (AAAS, 2007), were all continually consulted for developmental guidance. As a further resource for research on learning progressions and curricular designs, *Taking Science to School: Learning and Teaching Science in Grades K-8* (National Research Council, 2007) was extensively utilized. The following statement from this resource was a guiding principle:

"The next generation of science standards and curricula at the national and state levels should be centered on a few core ideas and should expand on them each year, at increasing levels of complexity, across grades K-8. Today's standards are still too broad, resulting in superficial coverage of science that fails to link concepts or develop them over successive grades."

Michigan's K-7 Scholar Work Group executed the intent of this statement in the development of "the core ideas of science...the big picture" in this document.

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Curriculum

Using this document as a focal point in the school improvement process, schools and districts can generate conversations among stakeholders concerning current policies and practices to consider ways to improve and enhance student achievement. Together, stakeholders can use these expectations to guide curricular and instructional decisions, identify professional development needs, and assess student achievement.

Assessment

The Science Grade Level Content Expectations document is intended to be a curricular guide with the expectations written to convey expected performances by students. Science will continue to be assessed in grades five and eight for the Michigan Educational Assessment Program (MEAP) and MI-Access.

Understanding the Organizational Structure

The science expectations in this document are organized into disciplines, standards, content statements, and specific content expectations. The content statements in each science standard are broader, more conceptual groupings. The skills and content addressed in these expectations will, in practice, be woven together into a coherent, science curriculum.

To allow for ease in referencing expectations for the draft review, each expectation has been coded with a discipline, standard, grade-level, and expectation number. For example, **P.MO.00.09** indicates:

P - Physical Science Discipline

MO-Motion of Objects Standard

00-Kindergarten Expectation

09-Ninth Expectation in the Kindergarten Grade-Level

Discipline 1 **Science Processes**	**Discipline 2** **Physical Science**	**Discipline 3** **Life Science**	**Discipline 4** **Earth Science**
Standards			
Inquiry and Reflection (IR)	Motion of Objects (MO) Energy (EN) Properties of Matter (PM) Changes in Matter (CM)	Organization of Living Things (OL) Heredity (HE) Evolution (EV) Ecosystems (EC)	Earth Systems (ES) Solid Earth (SE) Fluid Earth (FE) Earth in Space and Time (ST)

*(**Note:** Final coding will be different than this draft document coding, and will incorporate content statements and content expectations into the coding.)*

Preparing Students for Academic Success

Within the hands of teachers, the Grade Level Content Expectations are converted into exciting and engaging learning for Michigan's students. As we use these expectations to develop units of instruction and plan instructional delivery, it is critical to keep in mind that content knowledge alone is not sufficient for academic success. Students must be able to apply knowledge in new situations, to solve problems by generating new ideas, and to make connections between what they learn in class to the world around them. The art of teaching is what makes the content of learning become a reality.

Through the collaborative efforts of Michigan educators and creation of professional learning communities, we can enable our young people to attain the highest standards, and thereby open doors for them to have fulfilling and successful lives.

SCIENCE PROCESSES | Inquiry, Reflection, and Social Implications

S.IR.04.1 Inquiry involves generating questions, conducting investigations, and developing solutions to problems through reasoning and observation. Inquiry includes an analysis and presentation of findings that lead to future questions, research, and investigations.

S.IR.04.01 Make purposeful observation of the natural world using the five senses.
S.IR.04.02 Generate questions based on observations.
S.IR.04.03 Plan and conduct simple and fair investigations.
S.IR.04.04 Manipulate simple tools that aid observation and data collection.
S.IR.04.05 Make accurate measurements with appropriate units for the measurement tool.
S.IR.04.06 Construct simple charts and graphs from data and observations.
S.IR.04.07 Summarize information from data tables and graphs to answer scientific questions.
S.IR.04.08 Communicate and present findings of observations and investigations.
S.IR.04.09 Develop research strategies and skills for information gathering and problem solving.
S.IR.04.10 Compare and contrast sets of data from multiple trials of a science investigation, to explain reasons for differences.

S.IR.04.2 Reflecting knowledge is the application of scientific knowledge to new and different situations. Reflecting knowledge requires careful analysis of evidence that guides decision-making and the application of science throughout history.

S.IR.04.11 Use data/samples as evidence to separate fact from opinion.
S.IR.04.12 Identify the need for evidence in making scientific decisions.
S.IR.04.13 Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities.
S.IR.04.14 Identify technology used in everyday life.
S.IR.04.15 Identify current problems that may be solved through the use of technology.
S.IR.04.16 Describe the effect humans and other organisms have on the balance of the natural world.
S.IR.04.17 Describe how people have contributed to science throughout history and across cultures.

PHYSICAL SCIENCE | Properties of Matter

P.PM.04.2 Objects vary to the extent they absorb and reflect light energy and conduct heat and electricity.

P.PM.04.18 Identify objects that conduct heat and electricity.

P.PM.04.3 Matter exists in several different states: solids, liquids and gases. Each state of matter has unique physical properties. Gases are easily compressed, but liquids and solids do not compress easily. Solids have their own particular shapes, but liquids and gases take the shape of the container.

P.PM.04.19 Compare and contrast the states of matter.

P.PM.04.5 Magnets can repel or attract other magnets. Magnets can also attract certain non-magnetic objects at a distance.

P.PM.04.20 Identify materials that are attracted by magnets.
P.PM.04.21 Observe that like poles of a magnet repel and unlike poles of a magnet attract.
P.PM.04.22 Demonstrate why non-magnetic objects are affected by the strength of the magnet and the distance away from the magnet.
P.PM.04.23 Demonstrate magnetic field by observing the patterns formed with iron filings using a variety of magnets.

Energy

P.EN.O4.1 Heat, electricity, light, and sound are forms of energy.

P.EN.04.24 Identify forms of energy: heat and electricity.

P.EN.04.2 Increasing the temperature of any substance requires the addition of energy.

P.EN.04.25 Demonstrate how temperature can be increased in a substance by adding energy.
P.EN.04.26 Describe heat as the energy produced when substances burn, certain kinds of materials rub against each other, and when electricity flows through wire.
P.EN.04.27 Describe how heat is produced through electricity, rubbing, and burning.

P.EN.04.6 Electrical circuits transfer electrical energy and produce magnetic fields.

P.EN.04.28 Describe how electrical energy is transferred and changed through the use of a simple circuit.
P.EN.04.29 Describe how electricity flowing through a wire creates a magnetic field.

Changes in Matter

P.CM.04.1 Matter can be changed from one state to another and then back again. This may be caused by heating and cooling.

P.CM.04.30 Explain how matter can change from one state to another by heating and cooling.

LIFE SCIENCE

Organization of Living Things

L.OL.04.1 Animals need air, water, and a source of energy (food). Plants also require air, water, and a source of energy (light to make food). Plants and animals break down food to produce building material for growth and repair.

L.OL.04.31 Compare the needs of familiar plants and animals.

Evolution

L.EV.04.1 Different kinds of plants and animals have characteristics that help them to live in different environments.

L.EV.04.32 Illustrate characteristics and functions of observable body parts in a variety of animals that allow them to live in their environment.

L.EV.04.2 Individuals of the same kind differ in their characteristics, and sometimes the differences give individuals an advantage in surviving and reproducing.

L.EV.04.33 Explain how physical characteristics (traits) or adaptations of animals (sharp teeth or claws for catching and killing prey, or color for camouflage) help them to survive in their environments.

Ecosystems

L.EC.04.1 Organisms interact in various ways including providing food and shelter to one another. Some interactions are helpful: others are harmful to the organism and other organisms.

L.EC.04.34 Identify familiar organisms as part of a food chain or food web.

L.EC.04.2 When the environment changes, some plants and animals survive to reproduce; others die or move to new locations.

L.EC.04.35 Explain how environmental changes can produce a change in the food web.

EARTH SCIENCE — Earth in Space and Time

E.ST.04.1 Common objects in the sky have observable characteristics.

E.ST.04.36 Identify common objects in the sky, such as the sun and the moon.

E.ST.04.37 Compare and contrast the characteristics of the sun, moon and Earth, including relative distances and abilities to support life.

E.ST.04.2 Common objects in the sky have observable characteristics and predictable patterns of movement.

E.ST.04.38 Describe the Earth's revolution around the sun as it defines a year.

E.ST.04.39 Explain that the Earth's rotation creates day and night.

E.ST.04.40 Describe the motion of the moon around the Earth.

E.ST.04.41 Explain that the observable shape of the moon follows a predictable pattern from full moon to full moon which approximately defines a month.

E.ST.04.42 Describe the apparent movement of the sun and moon across the sky through day/night and the seasons.